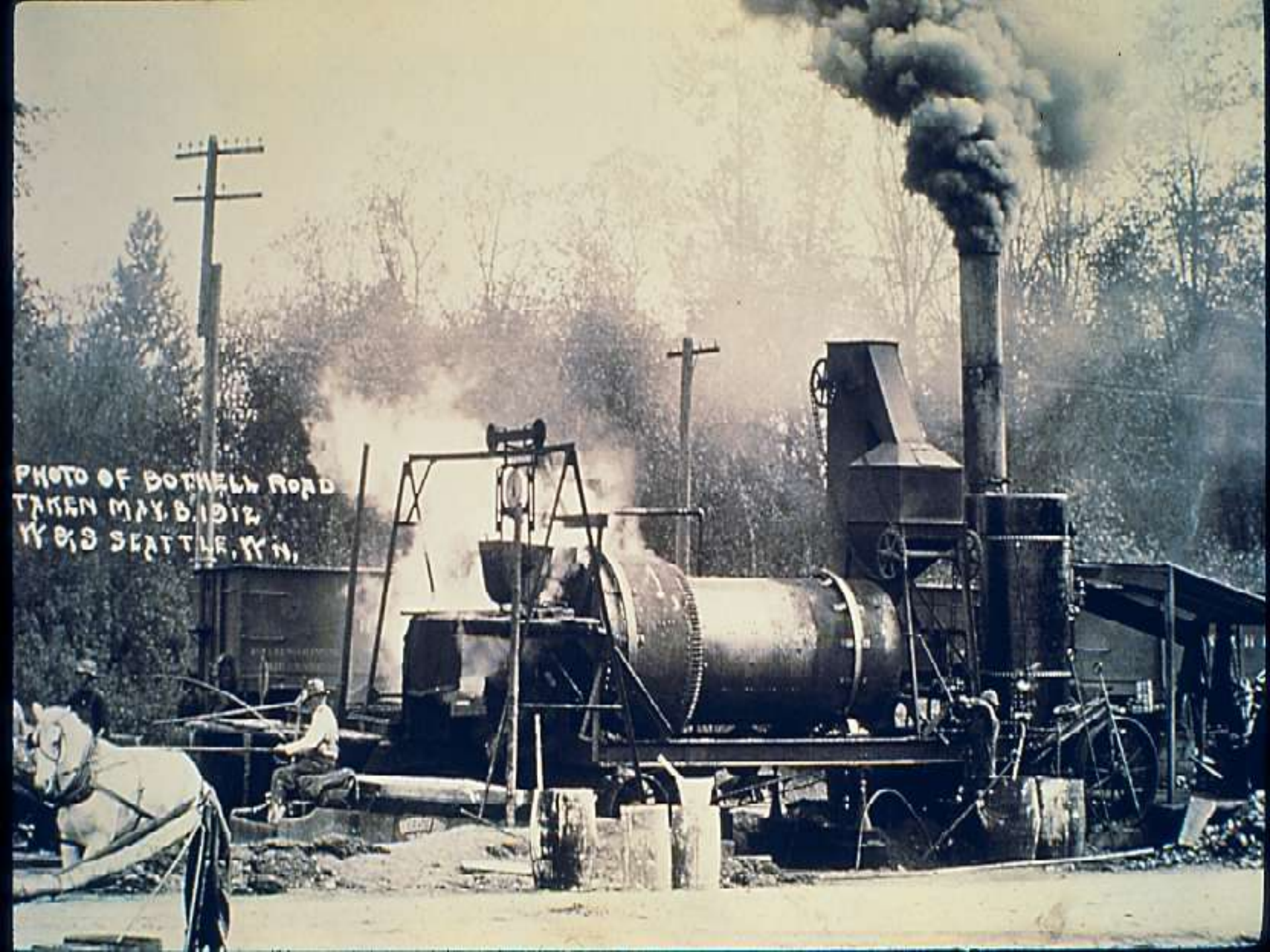


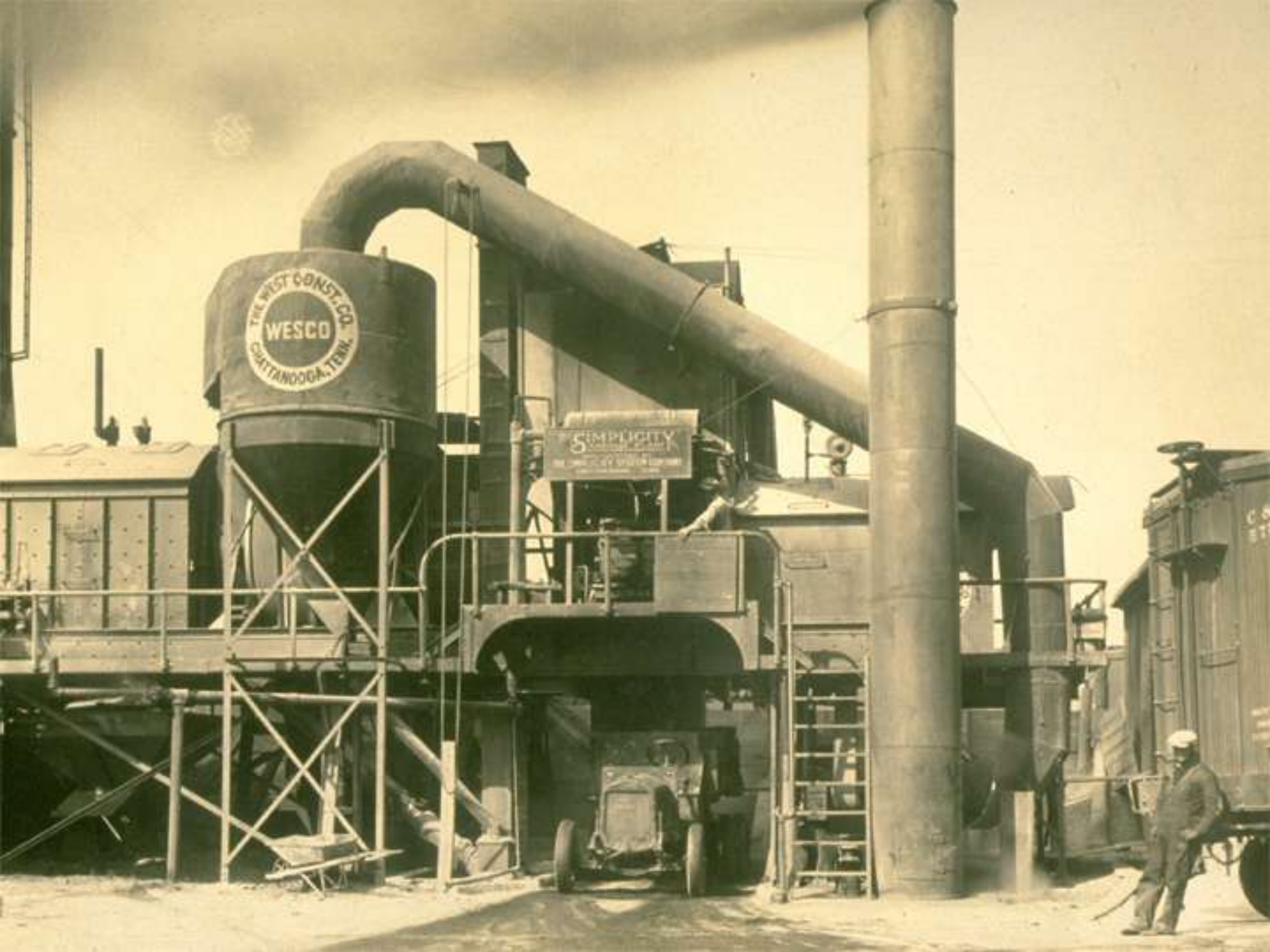
**CAPA/ NCDOT
Asphalt Training Workshop
February 21-22, 2012**

**Pavement Smoothness
Best Practices for Placement**

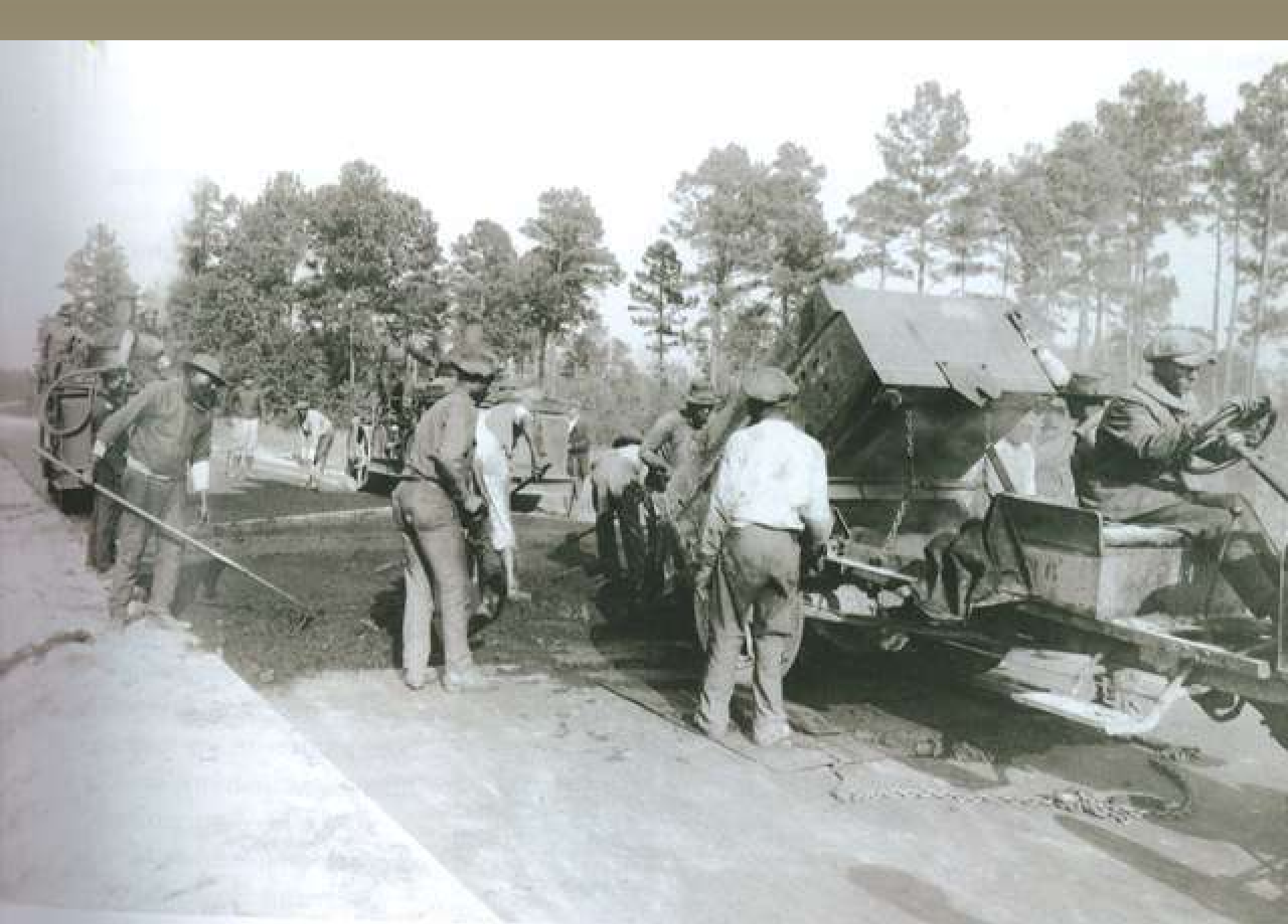
**Jeff Richmond, Sr.
President - Roadtec, Inc.**

PHOTO OF BOTHWELL ROAD
TAKEN MAY 6, 1912
Y & S SEATTLE, W. N.

















What the Customer's Demand

Long Life Pavement

Pavement Smoothness

No Material Segregation

No Temperature Segregation

Uniformity of Density

Speed of Construction

Minimizing Traffic Delays

Low Price



Profilograph



To overcome this problem the rolling concept was subsequently improved by adding an array of wheels to establish a reference plane from which to measure deviations and remains with us today memorialized as the Profilograph.

Road Profilers

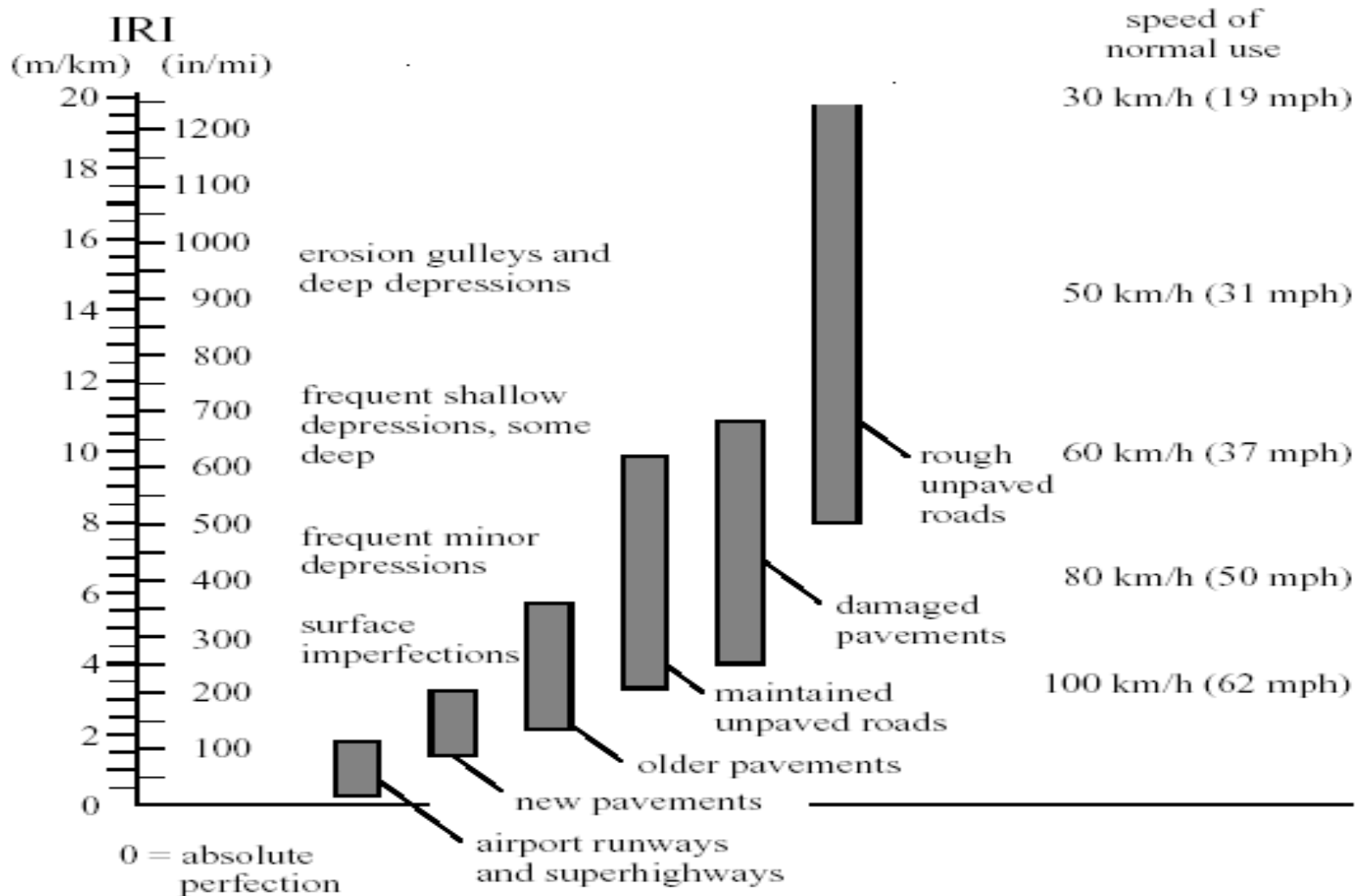


**ICC provided FHWA SHRP
with 4 profilers.**



**To date, ICC has installed over 300 systems into
different vehicles for high-speed data collection.**

The following figure shows IRI ranges represented by different classes of road.



Segregation



Layout and Job Prep



It's ok, it will cover

Cover it, is not the answer here. It is understood that not all jobs are perfect but the customer needs to know what happens when jobs are rushed.



Milling For Smoothness





Differential Compaction

Surface overlay

Freshly Placed Mat-75%

Profiled/Planed Off



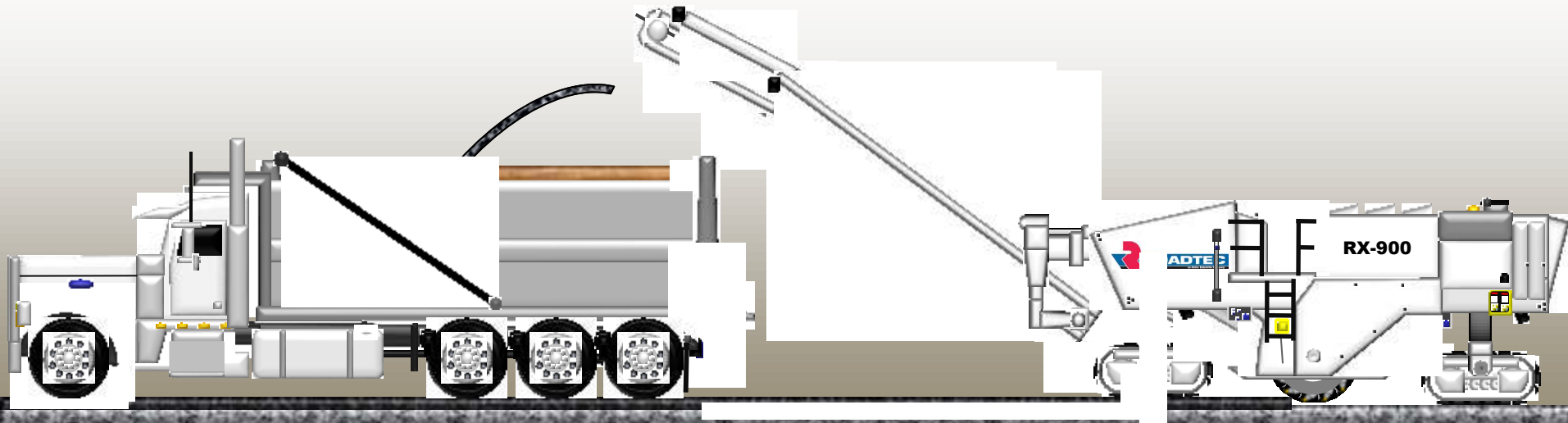
Original Uneven Base



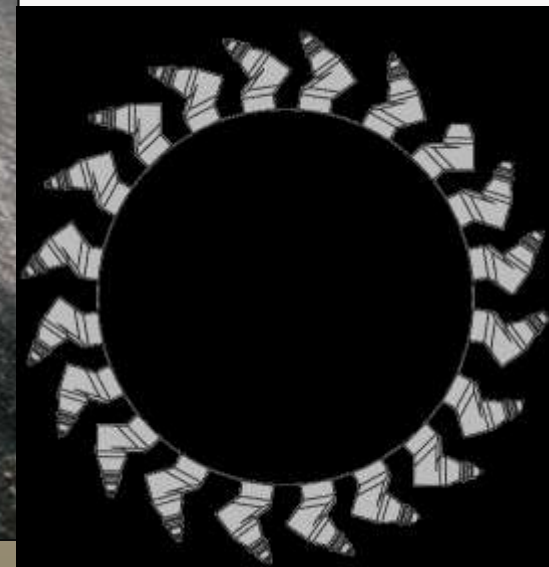
15 m (50 ft)

Proper Machine Operation

The milling operation shall produce a pavement surface that is true to line, grade, and cross section, and of uniform texture.



Check your teeth



12'6" Wide Micro-Milling Drum

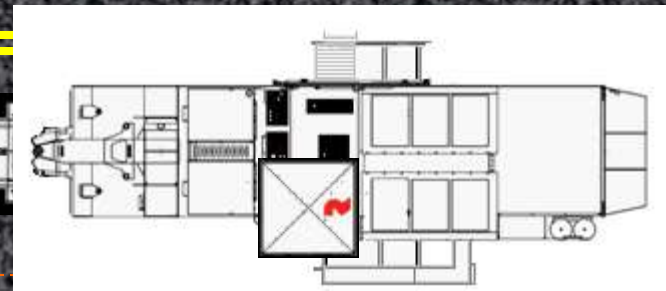


Operator

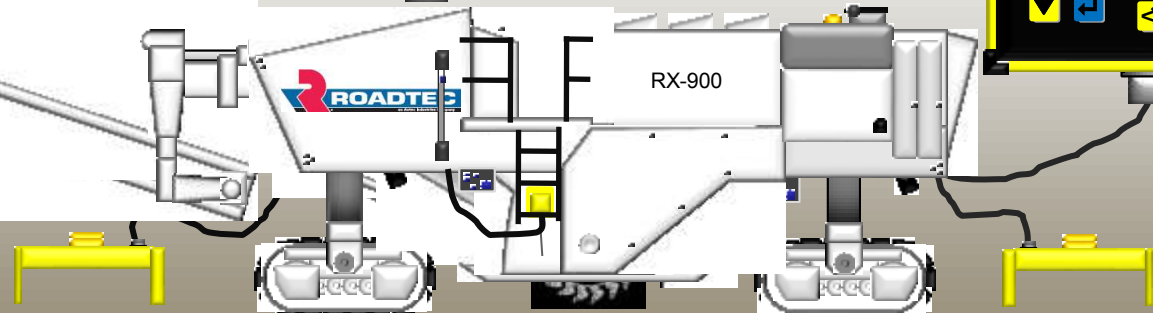
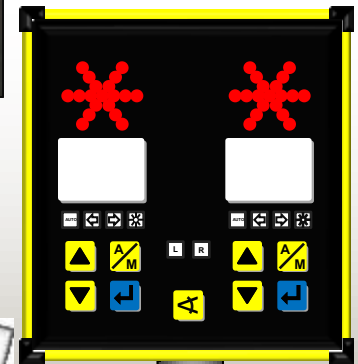
When its possible stage your trucks so that they can be loaded one after another.

By side loading your trucks you will save time between your truck transitions.

Remember that the conveyer will swing 60 degrees. Use this feature to your advantage.



Smooth Mill Ski



Welcome to the Paving Professionals Workshop



Balancing production

What will I need to get the job done on time?

This is determined by:

Asphalt Plant Production.

Truck Capacity.

Length Of Haul.

Traffic Conditions.



Asphalt Plant Production


We need to know how much asphalt can be produced for this job.

The plant may be making asphalt for jobs other than just our job.

The tonnage per hour that is available for your job is needed to calculate paver speed.





Paving Calculator

Most foremen today use a laptop computer. This information is all available through the  website.

This information will help us manage our jobs and balance our production. This balance will result in a better service to the customer.

Roadtec Paving Production and Trucking Calculator 1.0


 [Download Now](#)
(Paving Calculator1-0.xls - 83kB ~ 11sec @ 56 Kbps)

 [Email This Page](#)

The Paving Production and Trucking Calculator is a paving job management tool designed to help the supervisor of any paving operation with the day to day planning and analysis of projects. It uses many industry standard formulas to calculate many necessary values conveniently. It is a Microsoft Excel spreadsheet and includes instructions on how to use it. You will need Microsoft Excel to use this tool.

Please contact Roadtec at:
800 Manufacturers Road | P.O. Box 180515 | Chattanooga, TN 37485
Phone (423) 265-8600 | Toll Free 1-800-272-7103 | Fax (423) 267-7994

© 2001-2005 Astec Industries, Inc. All Rights Reserved. [Local Notices](#) | [Privacy Policy](#) | [Webmaster](#) | [Site Map](#)



Paving Calculator

Anything in a is user editable.

Total Paving Time	10 hours
Production Rate of HMA Plant for this project	300 tons/hr
Truck Capacity	18 tons
Paving Thickness	2 inches
Paving Width	15 feet
Uncompacted Material Density	140 lbs/ft ³
Density of mat before rolling	75 percent
Final density required	95 percent

No Shuttle Buggy

Truck Loading	10
Tarp	4
Haul to Site	20
Possible Delay	30
<i>(rush hour, school zones, etc.)</i>	
Waiting to Dump	10
Engaged w/ Hopper	8
Cleanup	5
Return Haul	20
Possible Delay	30
<i>(rush hour, school zones, etc.)</i>	

Trucks Needed 21.4

Trucks Needed with Delay 38.1

With Shuttle Buggy

Truck Loading	10
Tarp	4
Haul to Site	20
Possible Delay	30
<i>(rush hour, school zones, etc.)</i>	
Waiting to Dump	5
Engaged w/ Hopper	3
Cleanup	5
Return Haul	20
Possible Delay	30
<i>(rush hour, school zones, etc.)</i>	

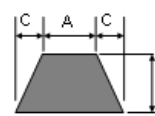
Trucks Needed 18.6

Trucks Needed with Delay 35.3

Paving Speed matched to production rate 28.6 ft/min

Windrow

Windrow Dimensions



A	12 inches
B	16 inches
C	6 inches

Cross-sectional area of mat 2.5 ft²

Cross-sectional area of windrow 2 ft²

Pounds per lineal foot of windrow 280 lbs/ft

Yield

Length of mat for one truck at 100% yield 102.9 feet

Actual Length 100.0 feet

Percent Yield 97.2 %

Expected Distance per Day 17142.9 feet

3.2 miles

Slope

Percentage Slope 2 percent

Fall @ 15 feet 3.6 inches

Starter Board

Total thickness including any existing mat 2.53 inches

Segregation

In summation, segregation in Hot Mix Asphalt mixtures is a common and persistent problem.

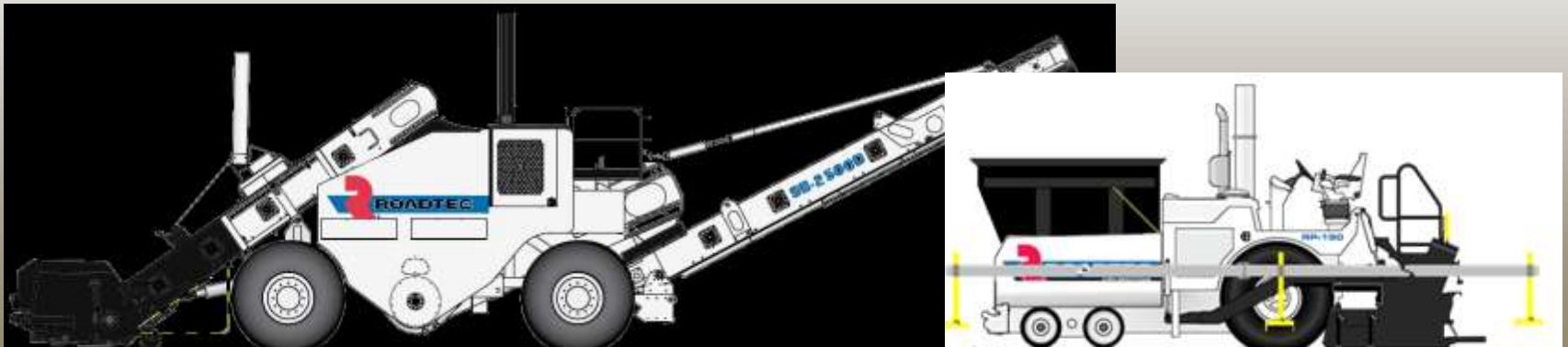
However, the problems can be controlled and even eliminated through:

Proper mix design

Proper maintenance

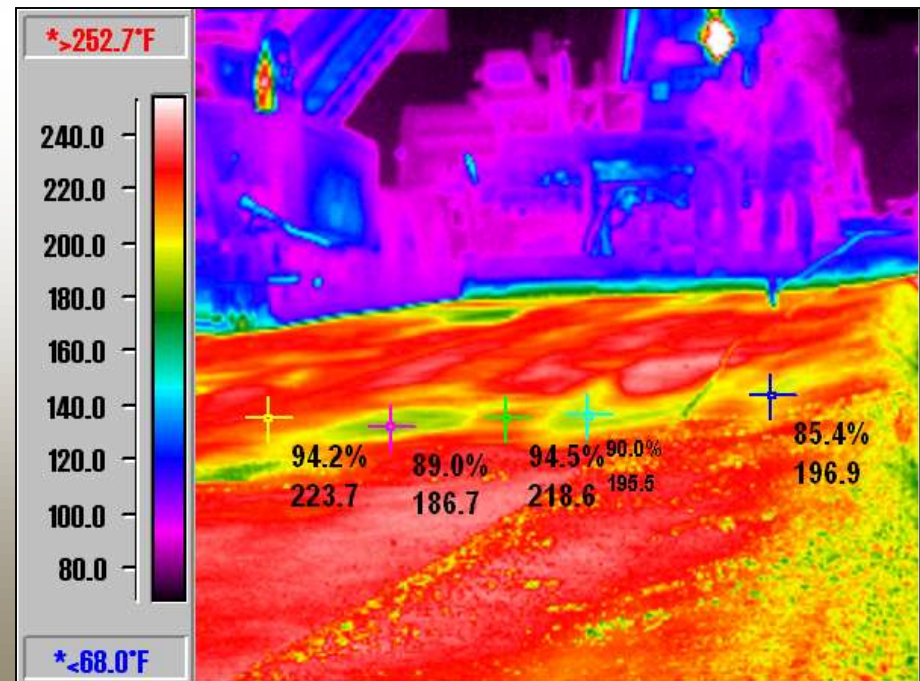
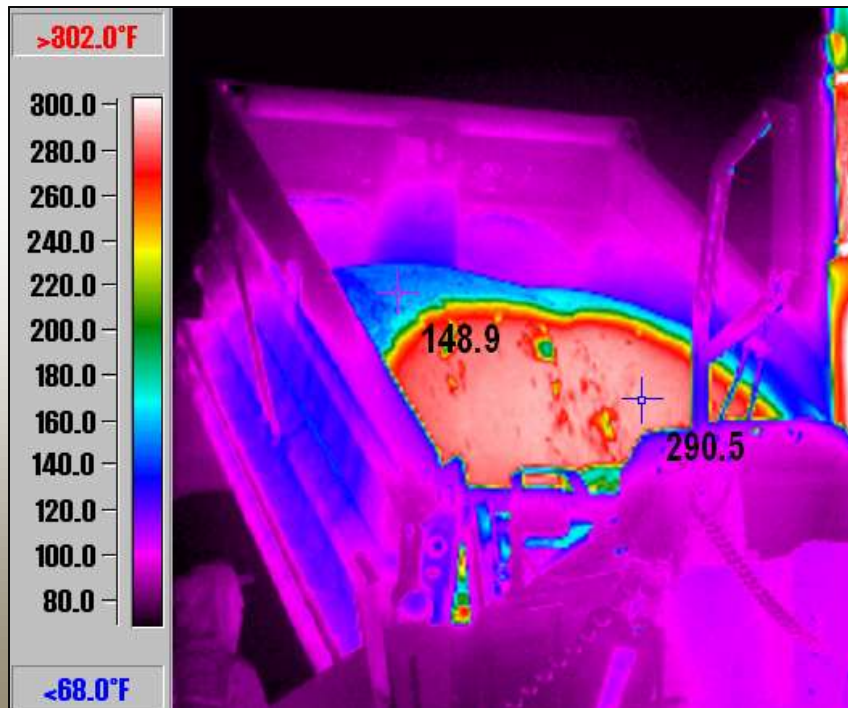
Operation of plants

Paving equipment



End Dump/No MTV

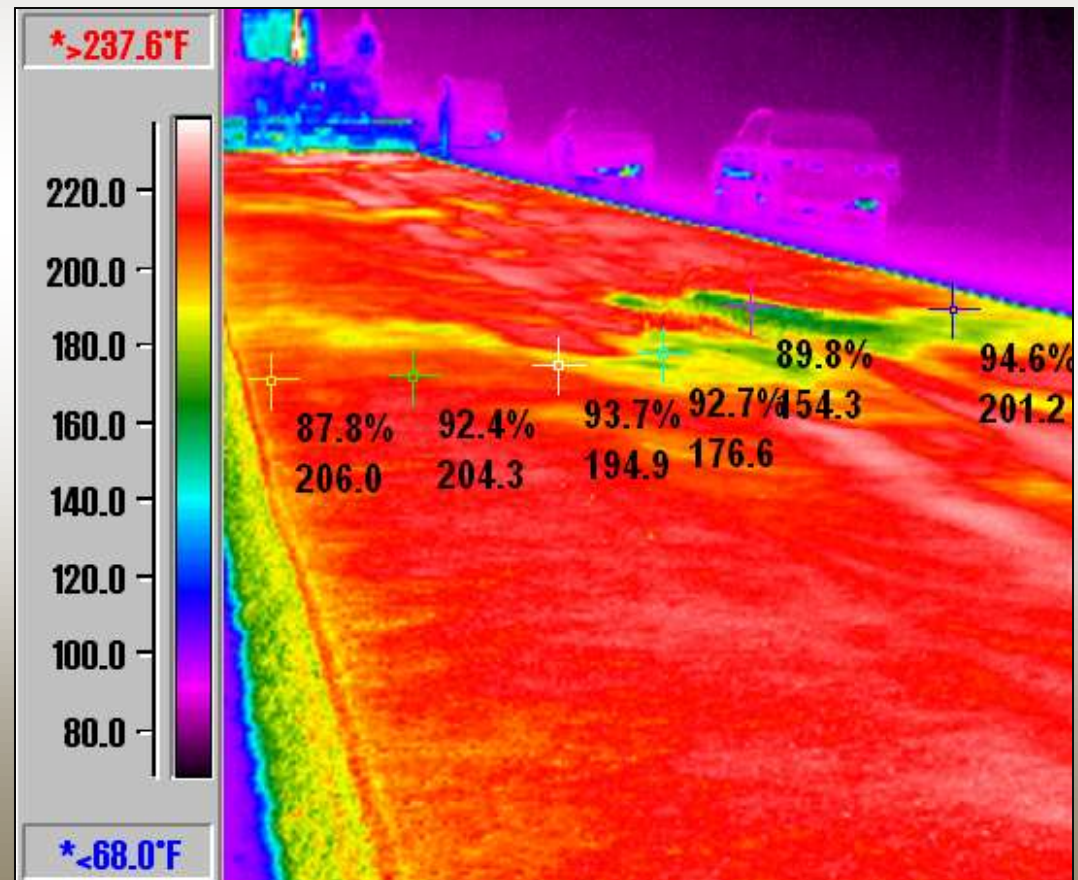
Low density, open texture areas in HMA which permanently fail by fatigue cracking, raveling, or both, directly relate to the thermal differentials.



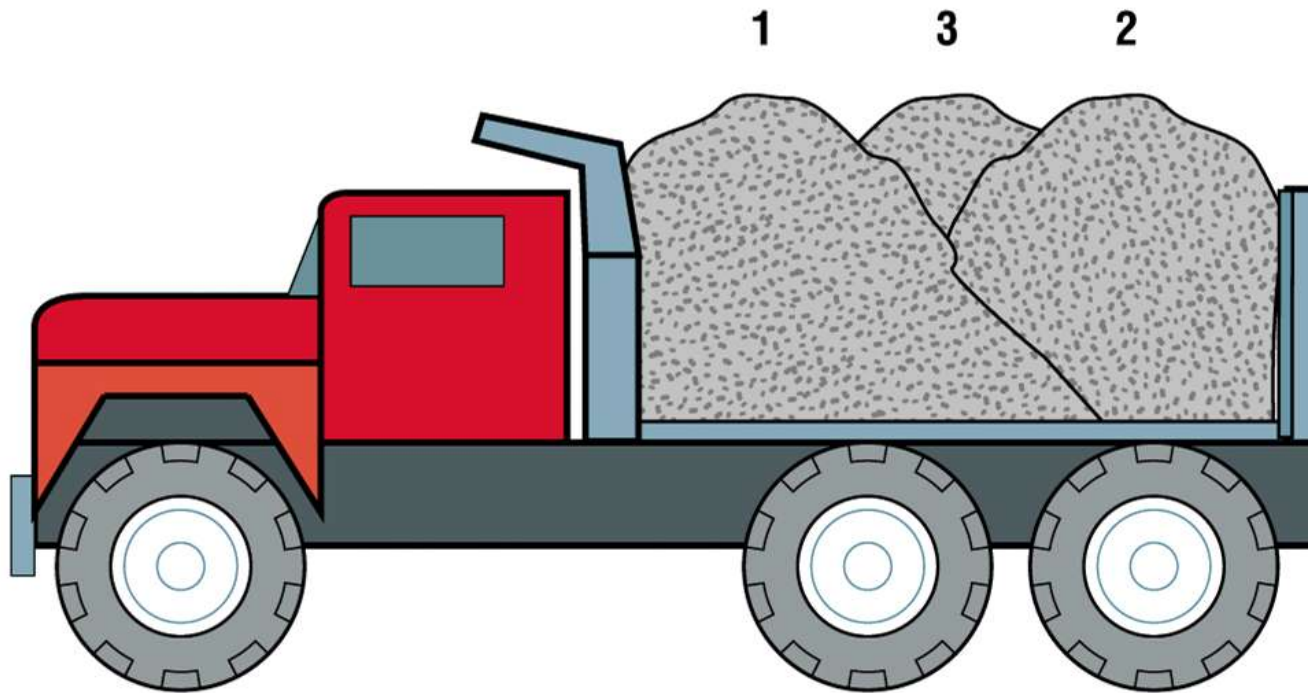
End Dump/No MTV

The cooler HMA formed during transport is placed in concentrated areas in the Mat and tend to resist adequate compaction.

These concentrated areas of cooler material usually have higher air voids, open surface texture that are more susceptible to deterioration.



THREE DIFFERENT DROPS



Proper Truck Loading

Remixing is the Critical Element

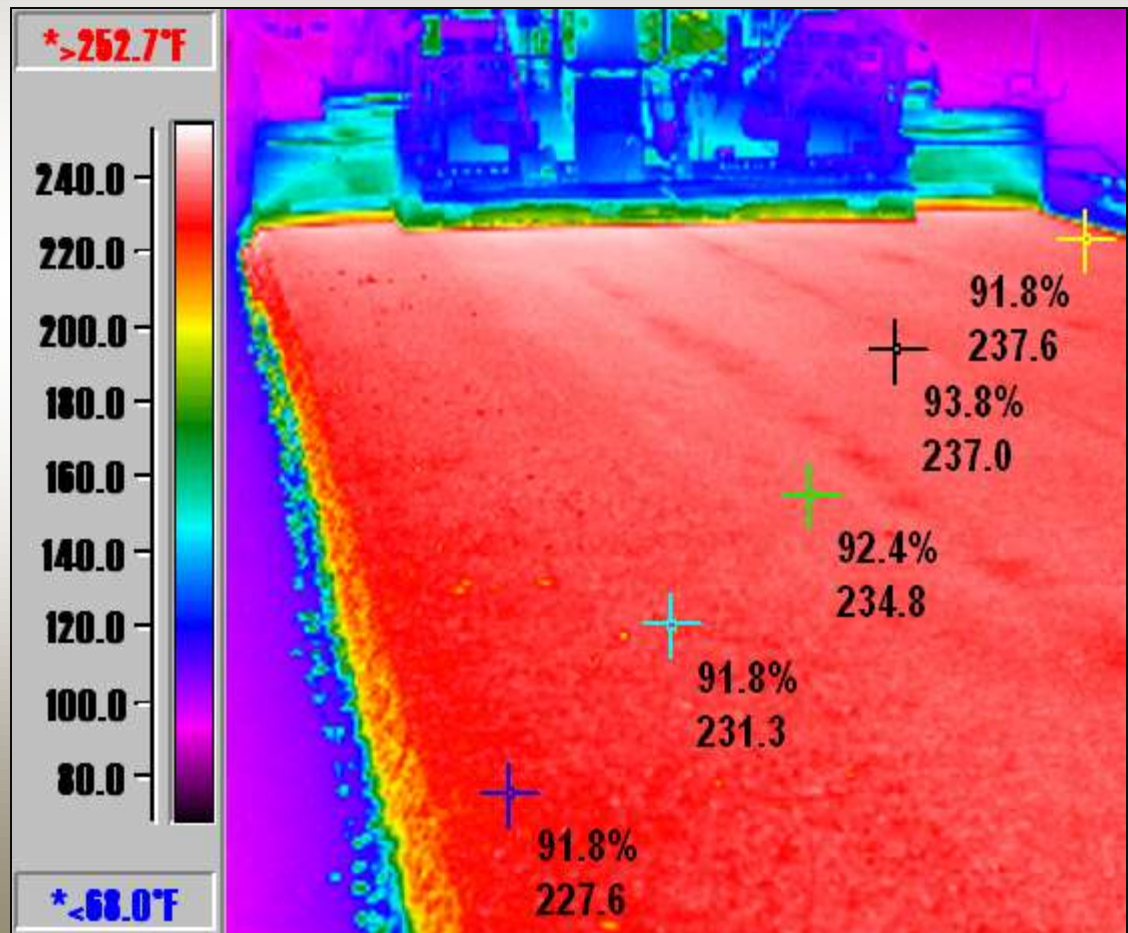


End Dump/Roadtec Shuttle Buggy

A number of factors will influence the amount of heat loss and the amount of temperature differential within the truck.

These factors are as follows:

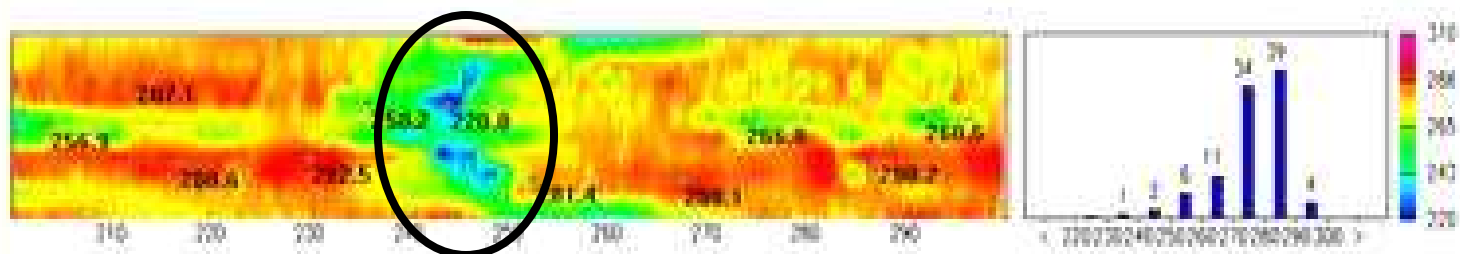
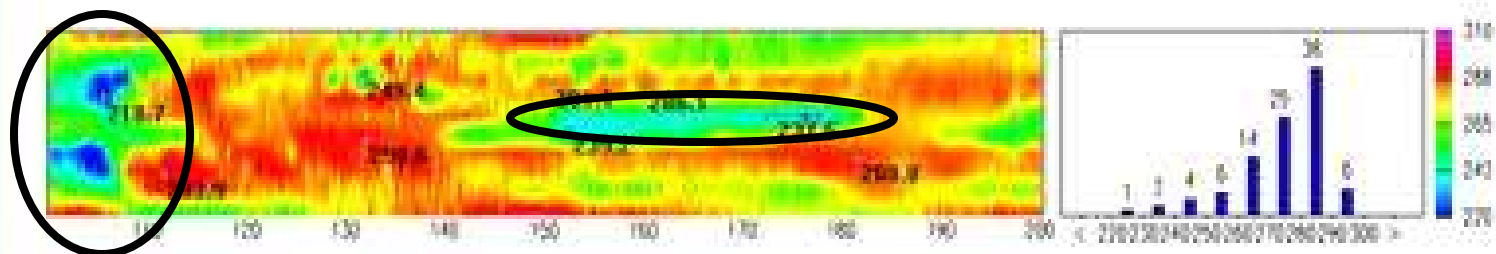
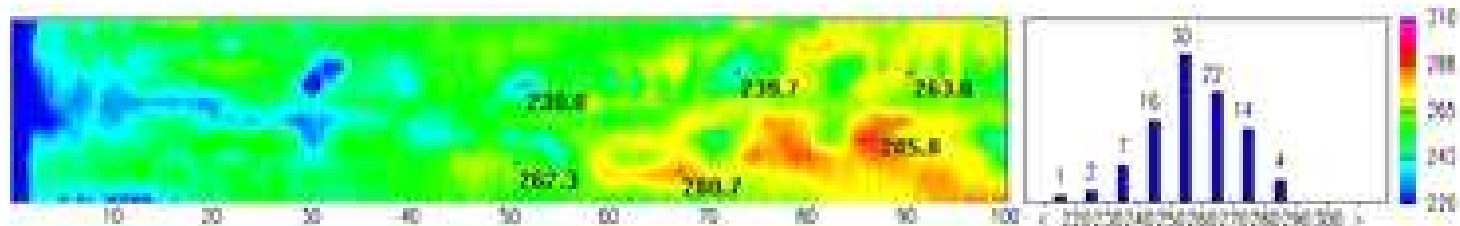
- 1) Mix temperature when loaded into truck
- 2) Ambient air temperature
- 3) Is the truck bed insulated
- 4) Size of truck bed in relation to tons of mix hauled
- 5) Length of haul
- 6) Speed of travel
- 7) Waiting time at paver
- 8) If the mix is covered
- 9) Traffic delays



Sensors Mount on Paver Footplate

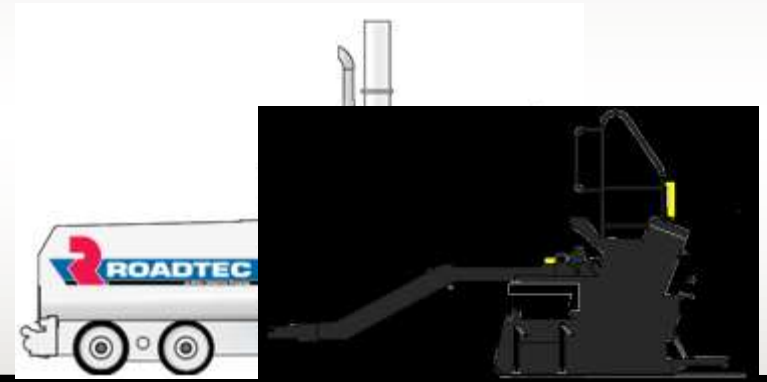
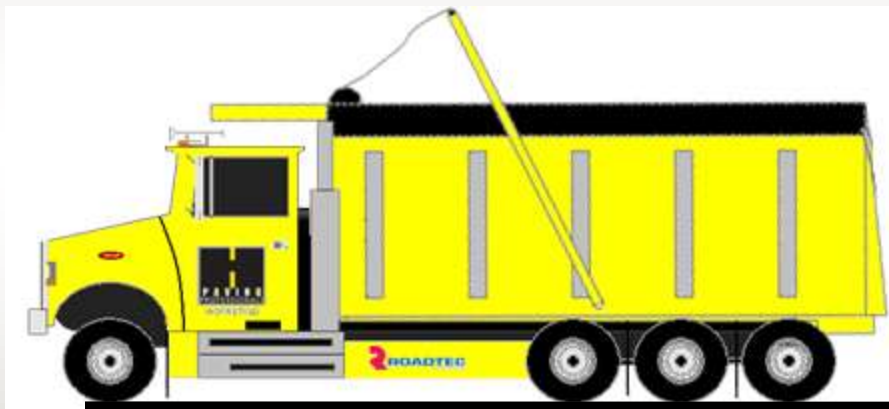


Sensor bars on footplate – control box and computer on operator's platform



...and document locations of suspected non-compliance

Anybody Know this Truck driver?



Keep control of your drivers. Slamming into the machine is a poor paving practice.

Explain to your drivers what you need and how they should approach the machine each time they unload.

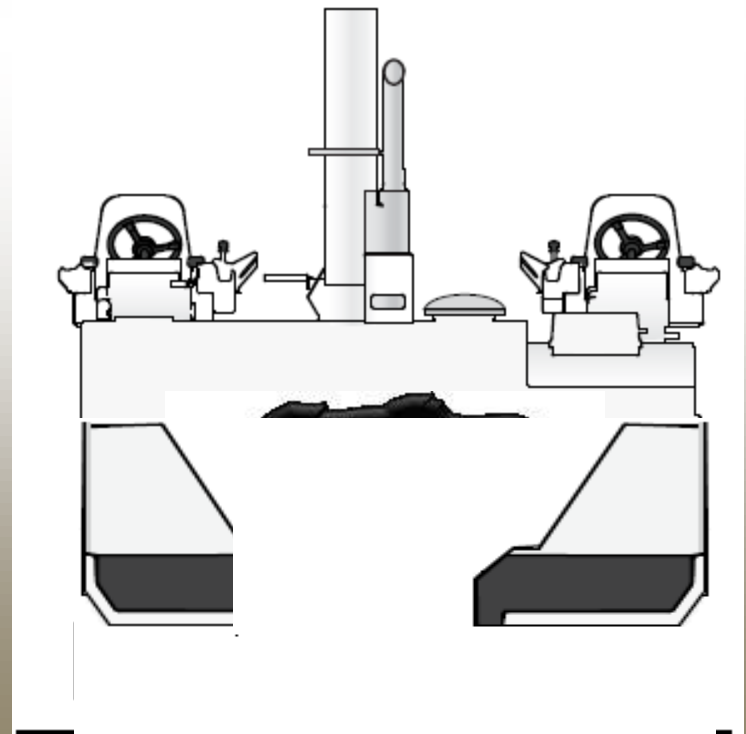
When should I empty the Hopper?

When you limit the amount of times you empty the hopper, you will have a much better Mat quality.

If the insert is always out or low, you will see the same problem with Material Segregation.

Stop the paver before the material drops below flow gate.

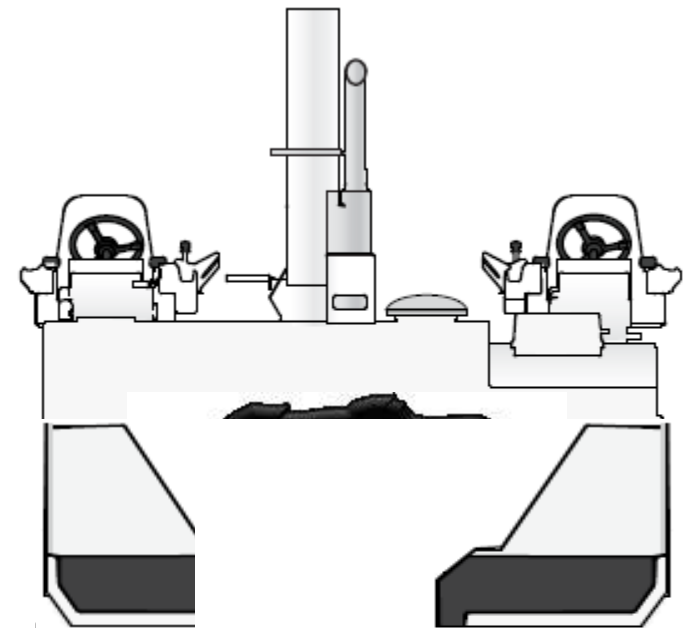
Set and keep the conveyor deck covered with a minimum of 6 to 10 inches of material.



When should I empty the Hopper?

When working with segregating materials, the hopper wings should only be cycled with the hopper relatively full.

This bunches the segregated materials that collect in the hopper wings instead of flipping them into an empty center area.



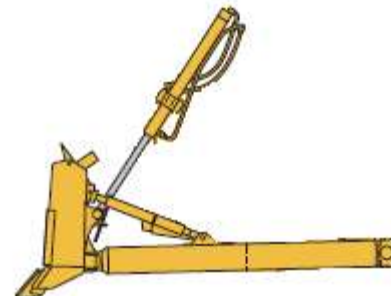
What happens here?



Optional Equipment

We like to think we are innovators in the asphalt industry, but when do you draw the line ?

Material is made to go into the hopper by design and end up on the ground, but at the rear of the machine.



Dump Person

Be sure the truck driver and the paver operator know when you are between them.

Be aware if the back up alarms on the trucks are not working.

Communicate well with the truck driver when it comes time to pull out in live traffic. Make sure it is safe.

Takes tickets from drivers

Keep unwanted material off the road in front of the paver

Looks out for power lines and limbs



Trucking Issues

Things that can cause the truck to turn over are:

Unlevel surface

The load can stick or hold together

All of the mix is on one side

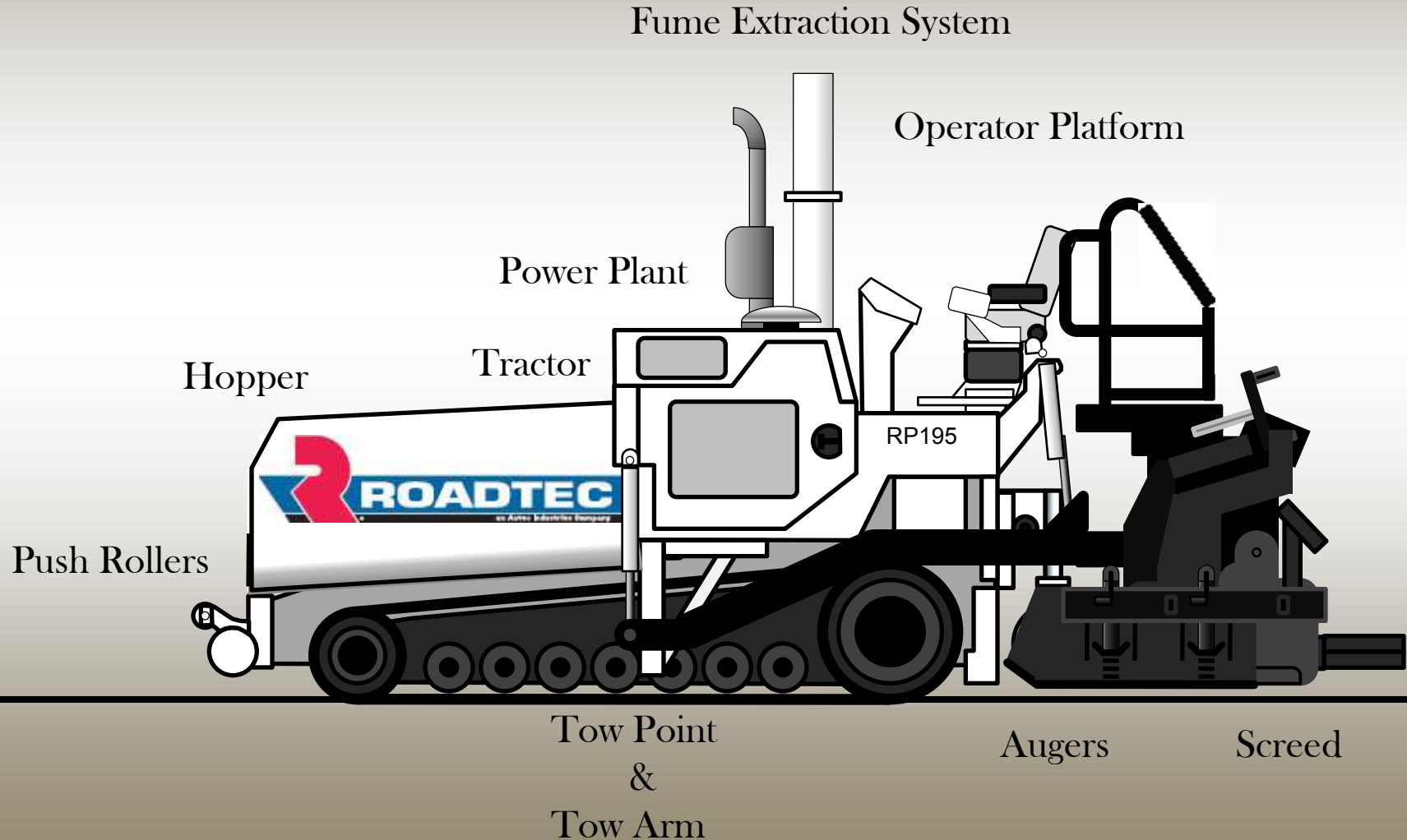
Dropping dead axle helps keep a truck from turning over.

Put mix in the bottom to help level the truck.

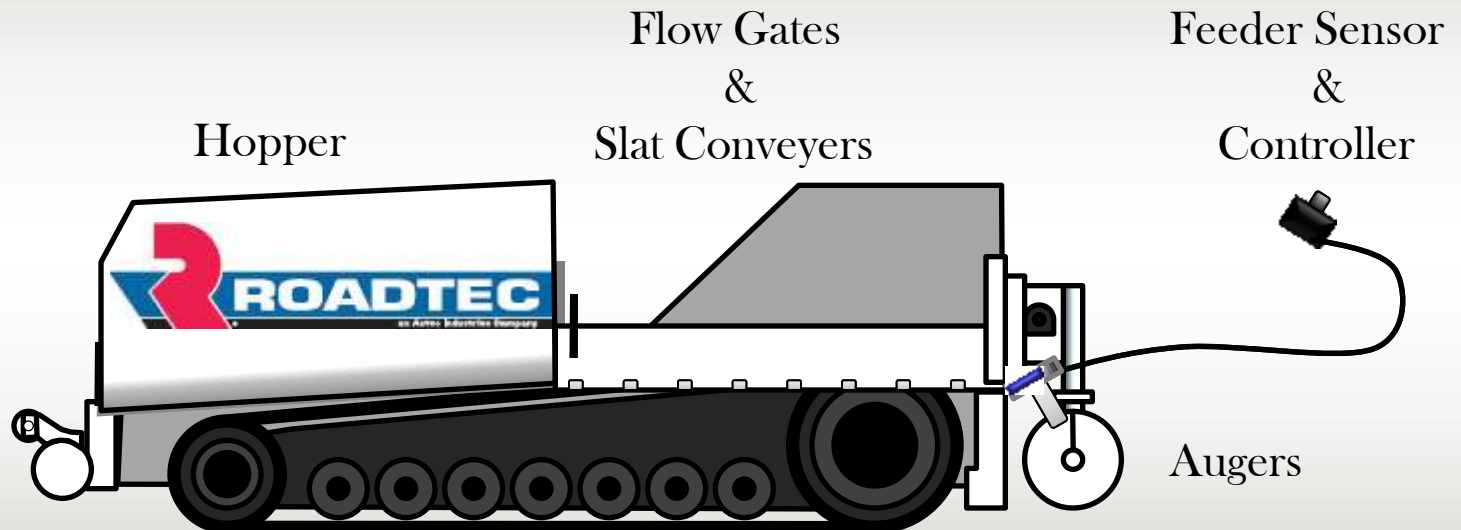
Cylinder or mechanical failure



Paver Components



Feed System Components



The Hopper is to receive the mix

Slate conveyors carry it through the paver tunnel

Flow gates to strike off the mix

Augers to distribute the mix in front of the screed

Sensors to control the material level at the outboard edge of the screed

It's All Balance

To consistently build high quality, smooth riding roads, the paving speed **MUST** be at a constant rate.

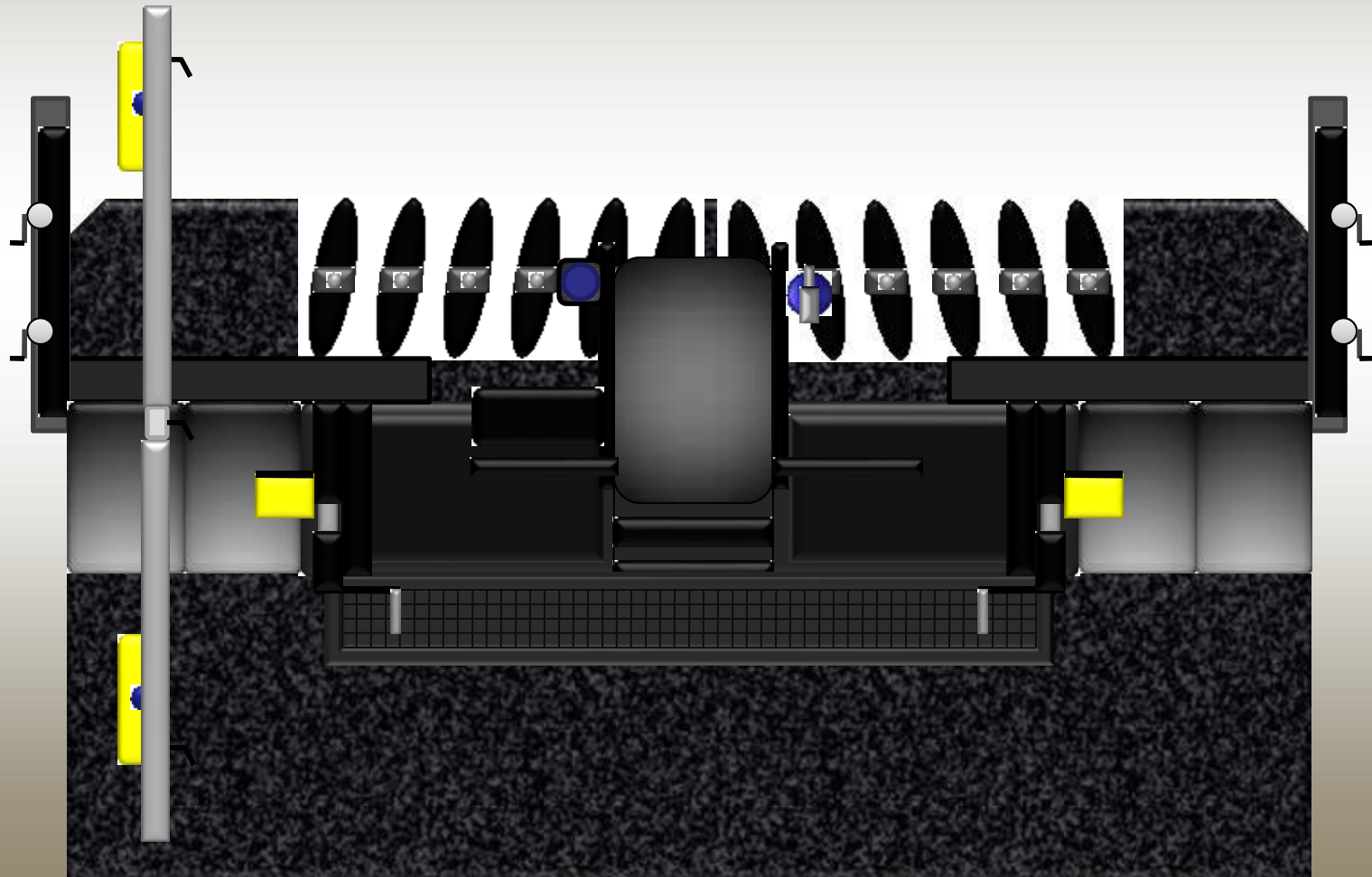
Quality Paving Techniques:

- 1) Uniformed “Head of Material”
- 2) Proper Angle of Attack
- 3) Constant Speed of Paver



Consistent head of material

When you have a consistent head of material, you can usually see a Mat that is flawless and very uniform in density.

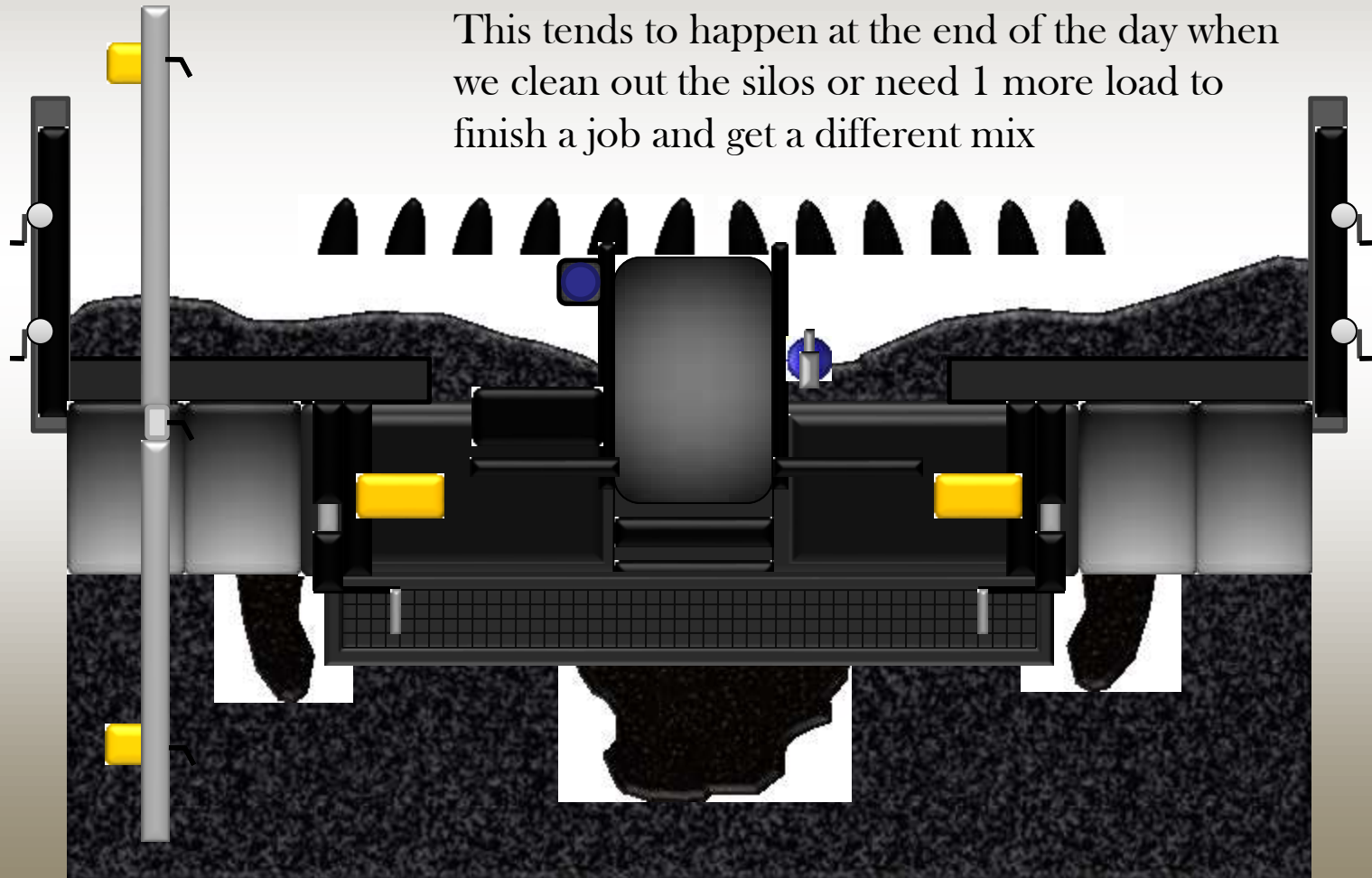


Irregular head of material

When you have an irregular head of material, you can usually see the same imperfections in the Mat.

Gradation changes in the mix design will effect how a screed reacts.

This tends to happen at the end of the day when we clean out the silos or need 1 more load to finish a job and get a different mix



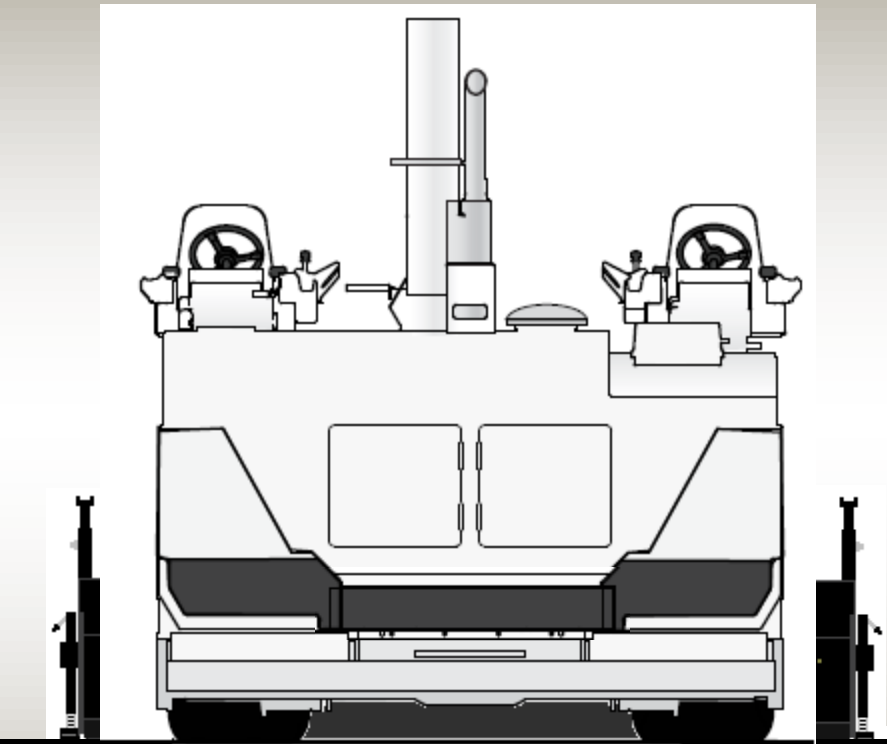
Say When !!

What's happening to this screed ?

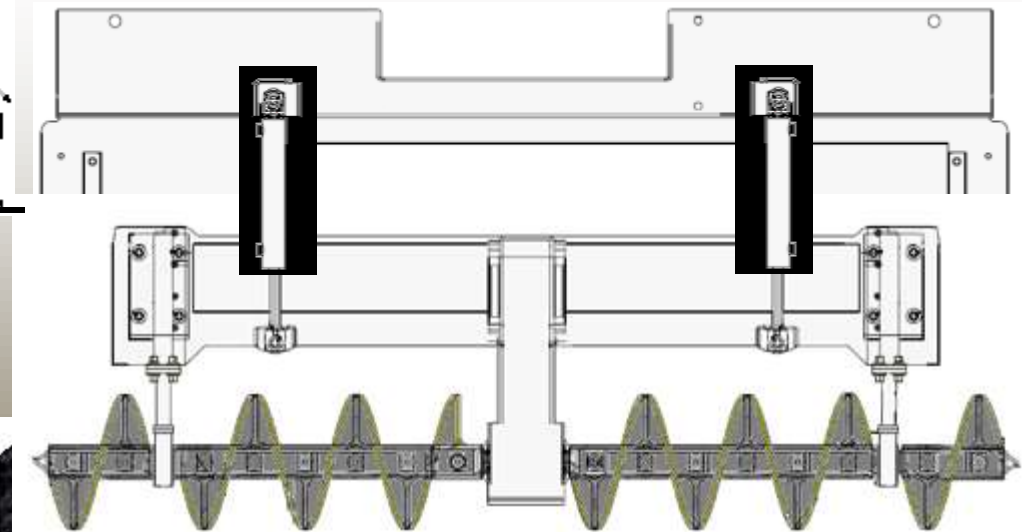
And what if we were going to bring our end-gate in, what would happen?



Proper Pile Height



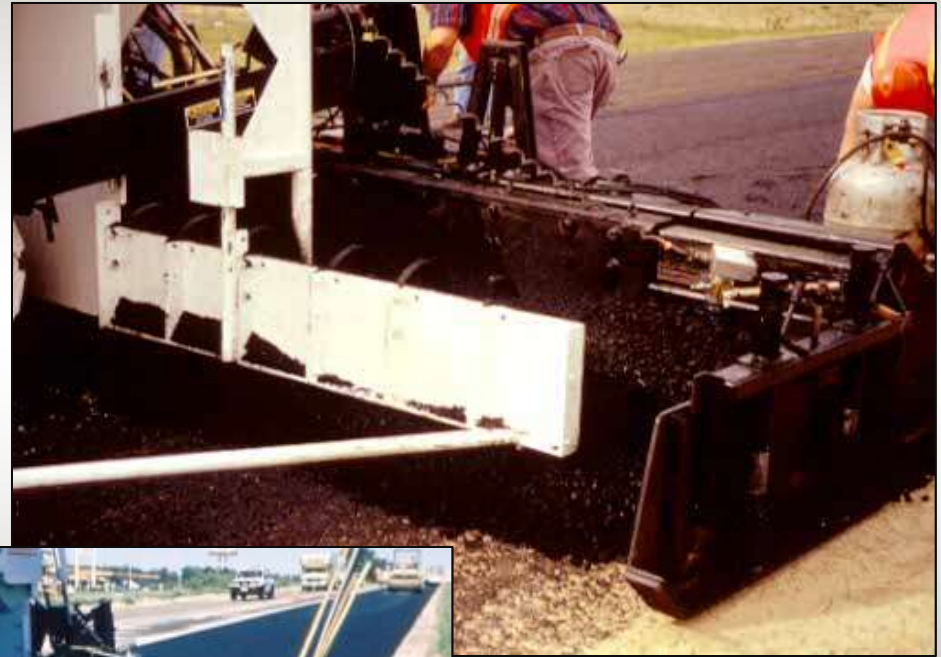
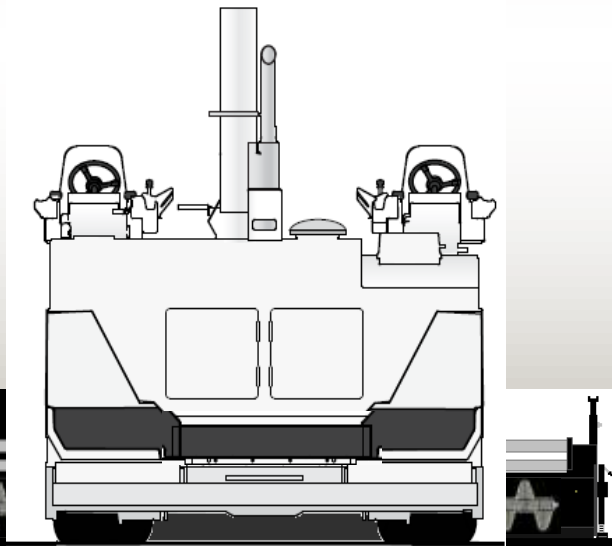
What we see is the correct head of material and an even flow of material across the auger chamber.



Auger Extensions

Auger extensions should always be used when wider paving is done.

Some material designs may require additional auger extensions that would not be required when working with traditional material designs.



Automation

How to effectively run Grade and Slope Control

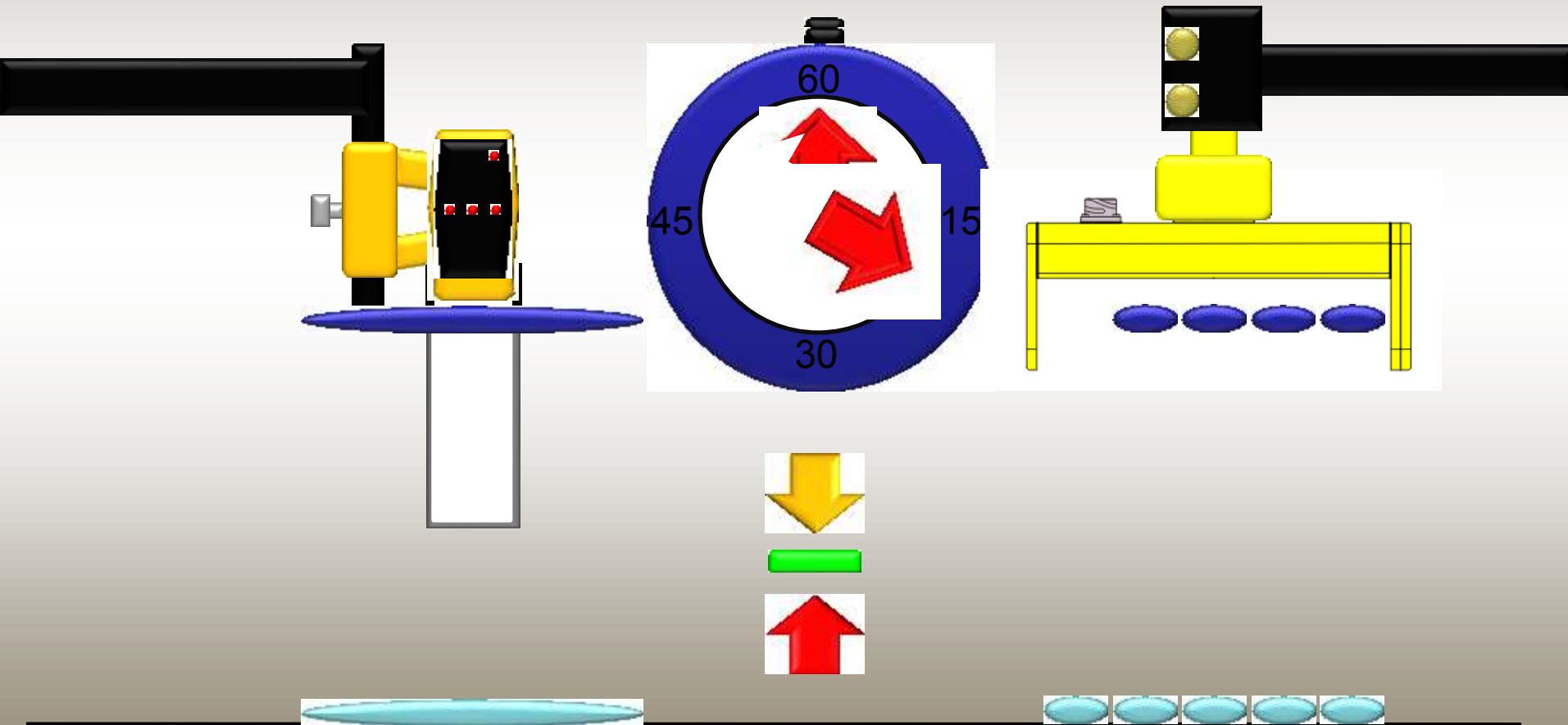


When you are running automation all of the paving principles do not apply.

Things like paver speed and head of material is simply smoke and mirrors. It's automatic, kind of like auto-pilot.

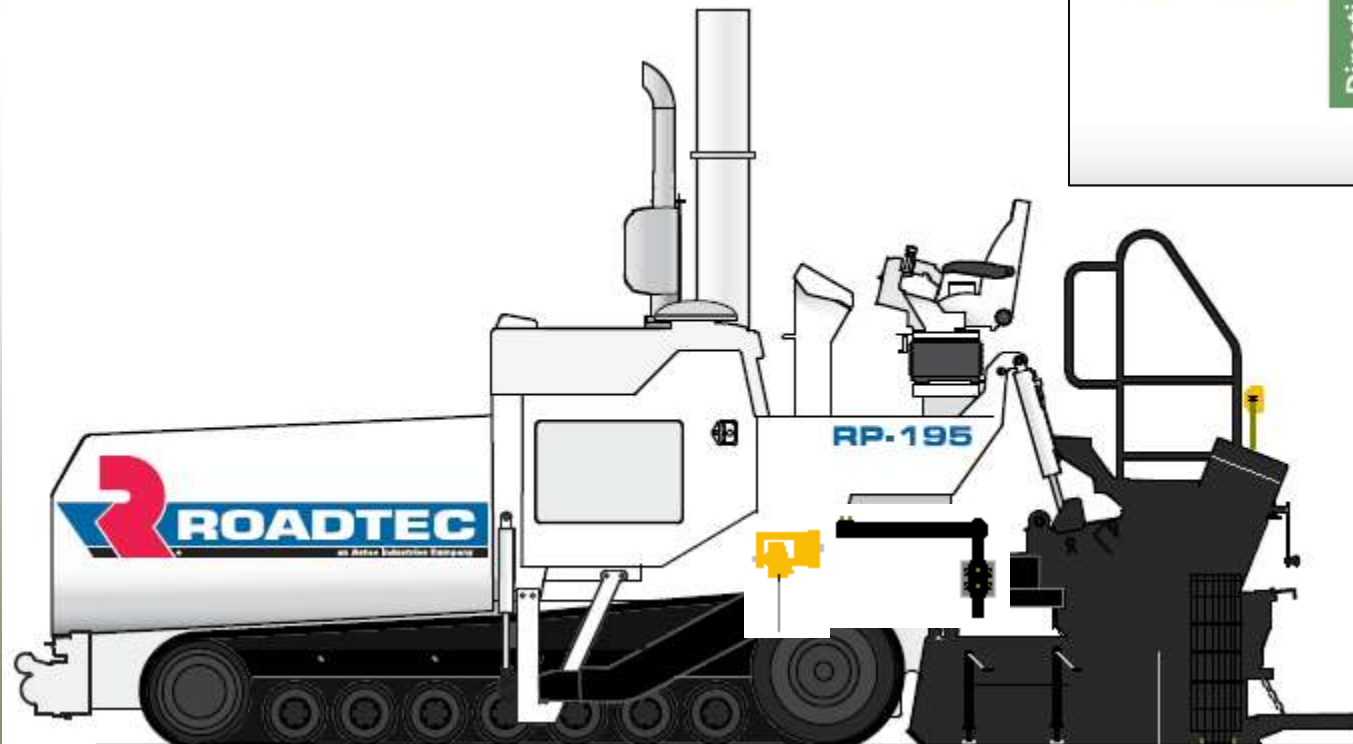
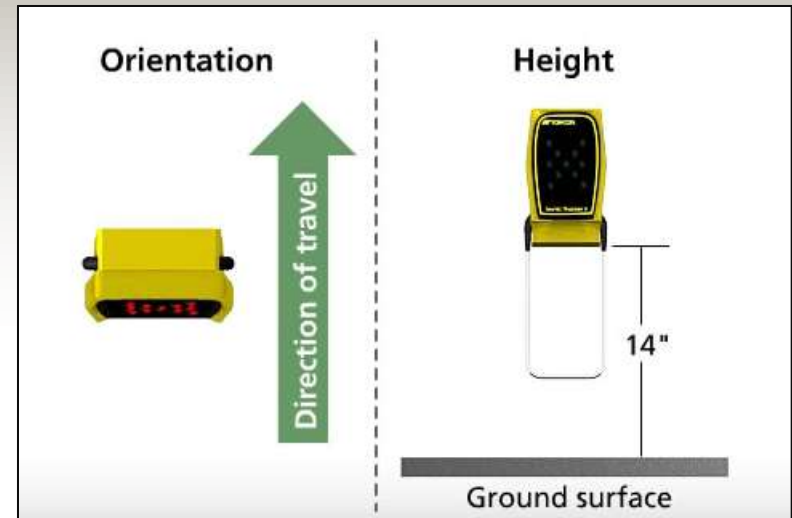
Sonics

Sonics work like a stopwatch. When the signal leaves the transducer the time starts. As it reflects off the surface and returns to the transducer the time stops and becomes your on grade mark.



Sensor height

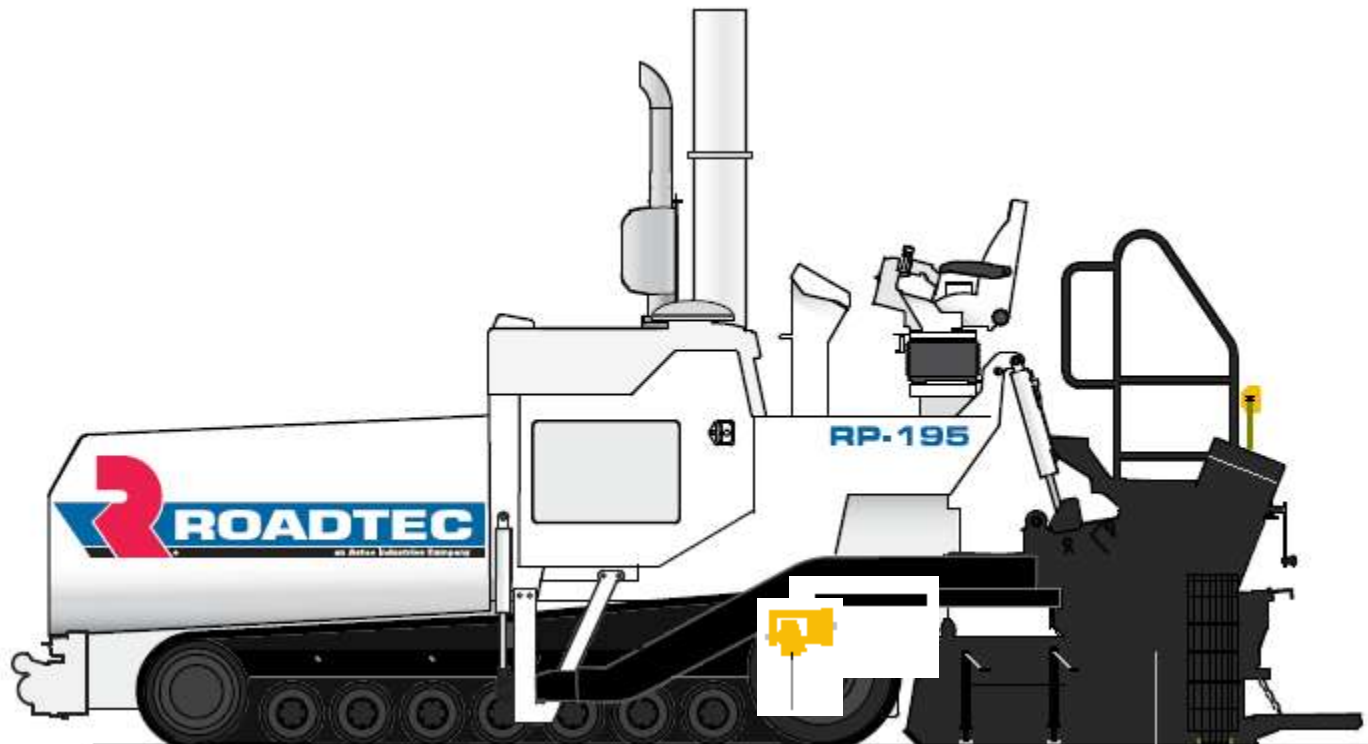
Make sure the sensor is at the correct height.



Joint Matching

When you match a joint you will want to move back towards to the rear.

The best way for you to get the best results is to go into the control box and increase the off-sets more.

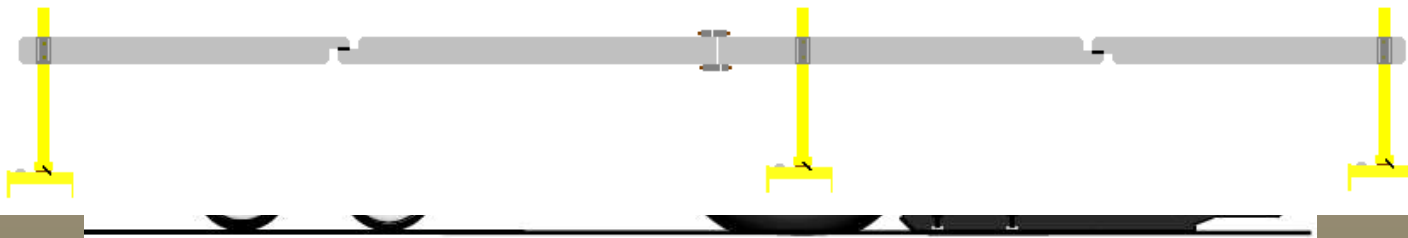
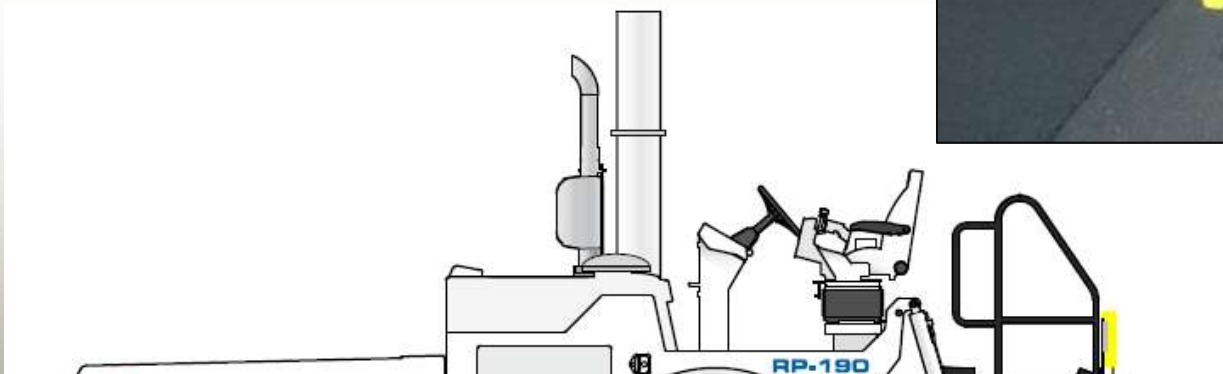


Moba Big Ski

Three sensors mounted together on a fixed beam,

Typically you run all three sensors but you have the option to run just the middle.

The same sensor height applies. (14")

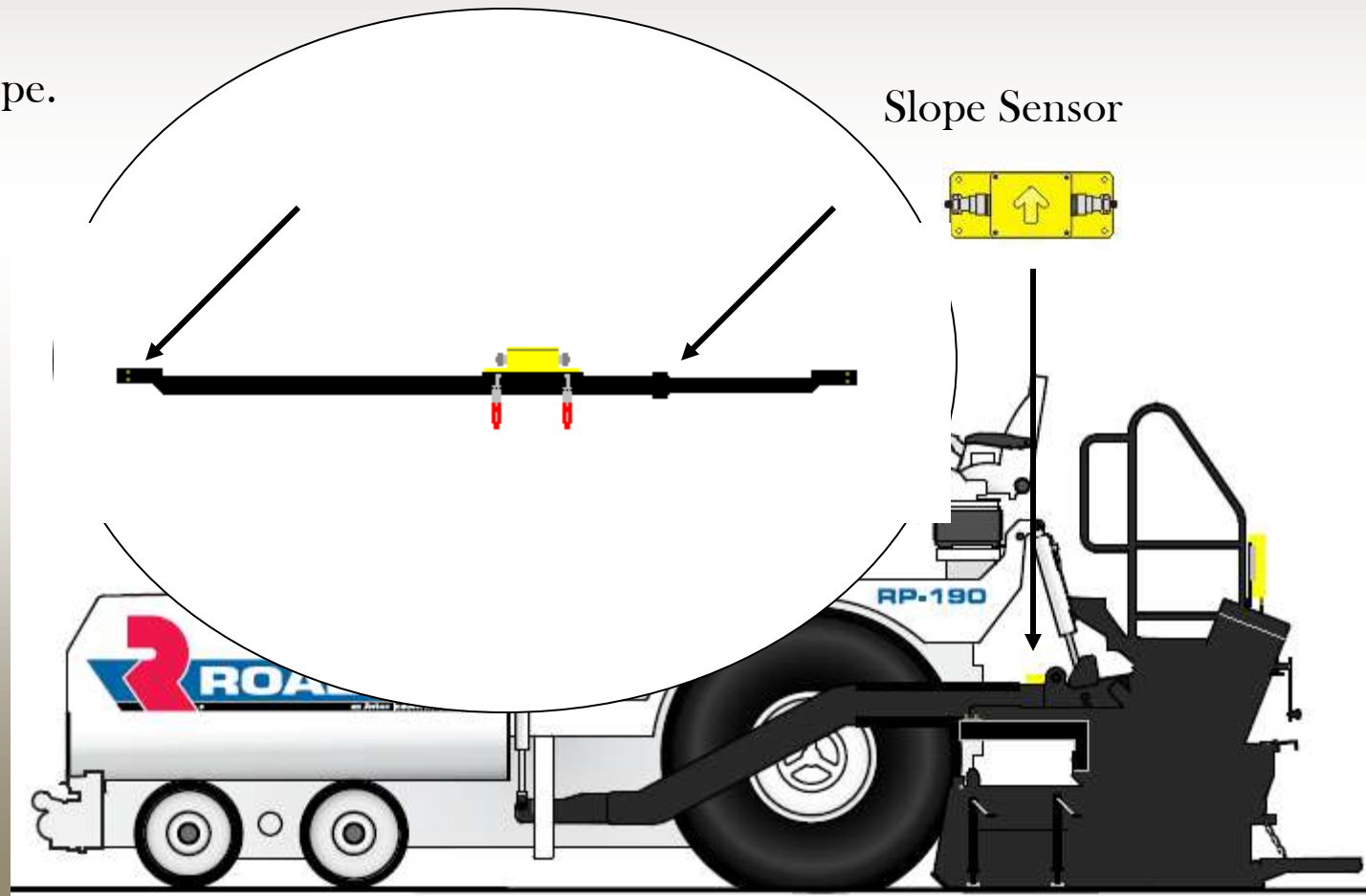


Running Slope

Before running slope you should see what the existing road looks like.

Determine what is more important:

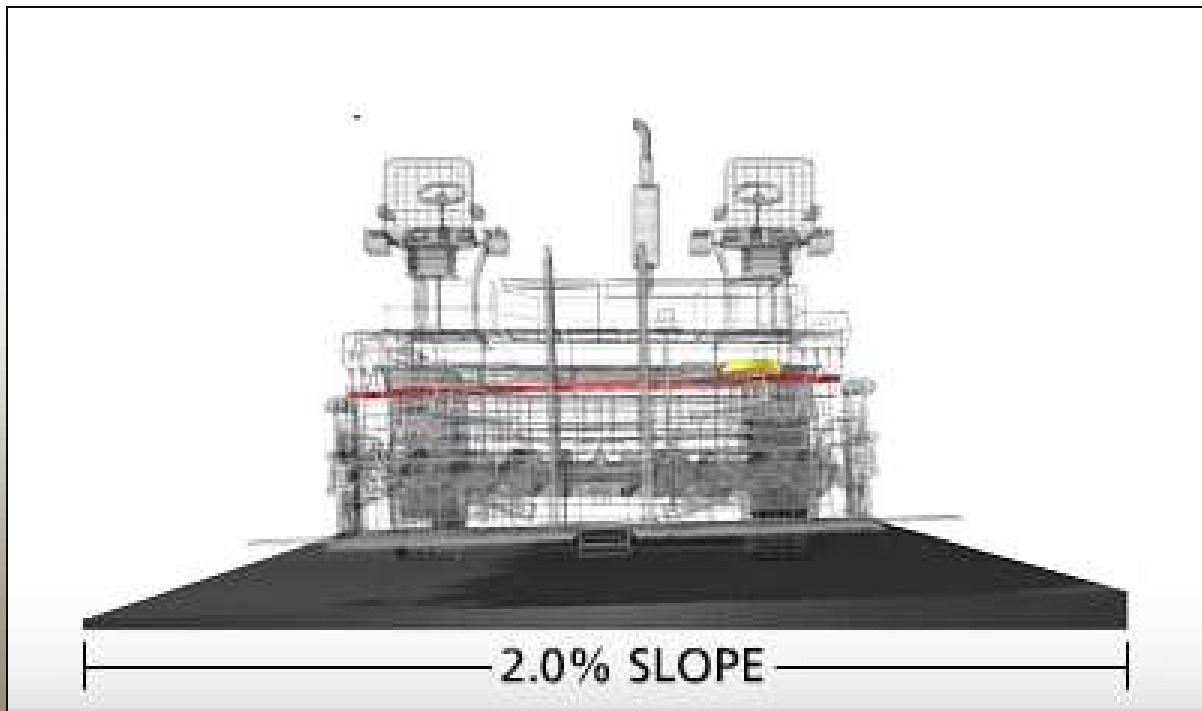
1. Depth
2. Correct cross slope.



Slope Control

Slope is by far the most argued application. Inspectors love to run slope.

It is most important that you understand, what is on the bottom dictates the thickness in the top.



Check your Slope

As you can see here it is what's below that will tell the tale of depth.

What's on that level is the most important thing when running slope.

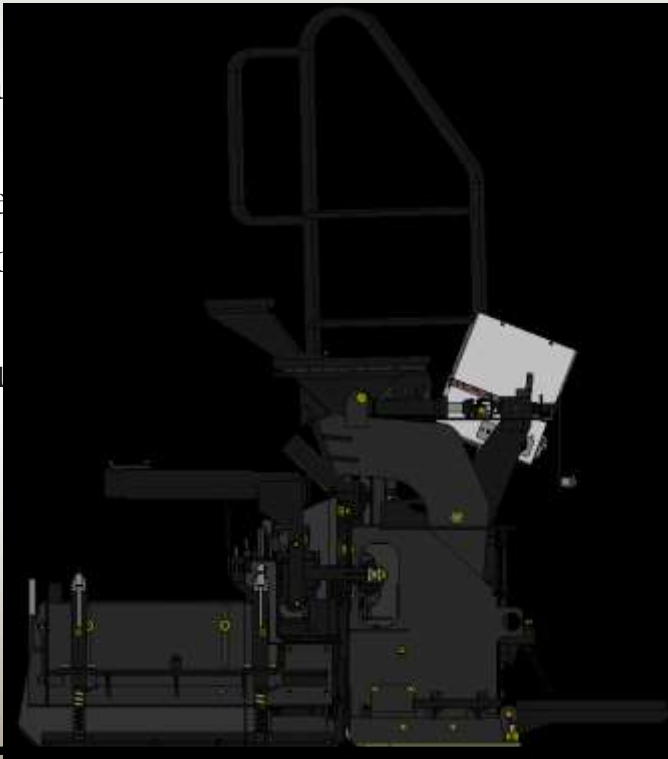
Some people don't use a digital level so as a rule of thumb if you use another form of measurement you would need a $\frac{1}{4}$ of an inch per foot to configure the slope..



Paving Principles

The main purpose of the screed is to:

1. Spread material
2. Provide compaction
3. Contour surface

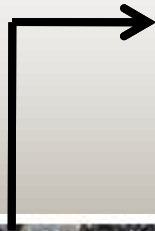


Aggregate size

Mat problems occur if mat thickness is less than $1 \frac{1}{2}$ times the largest aggregate size.

For commercial mixes, $1 \frac{1}{2}$ times the largest aggregate may be fine.

We know now with SMA and super pave mixes with stone on stone matrix, that we need 3-4 times the largest aggregate diameter to float the screed and get good compaction.

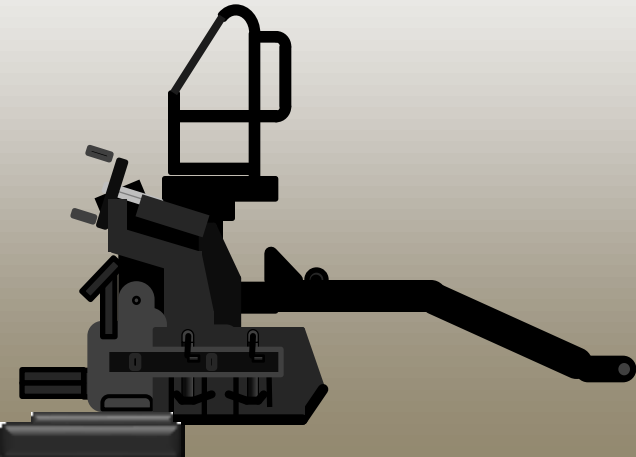


Mat Thickness Chart



To achieve the proper Mat thickness, you should always allow for roll down.

Roll down is the differential between the non-compacted and compacted material.



To Achieve Final
Mat Thickness:

Requires an Initial
Thickness Of:

1" or 25.4 mm

1.26" or 32.0 mm

2" or 50.8 mm

2.53" or 64.3 mm

3" or 76.2 mm

3.79" or 96.3 mm

4" or 101.6 mm

5.05" or 128.3 mm

Mat Thickness Chart

Screeds

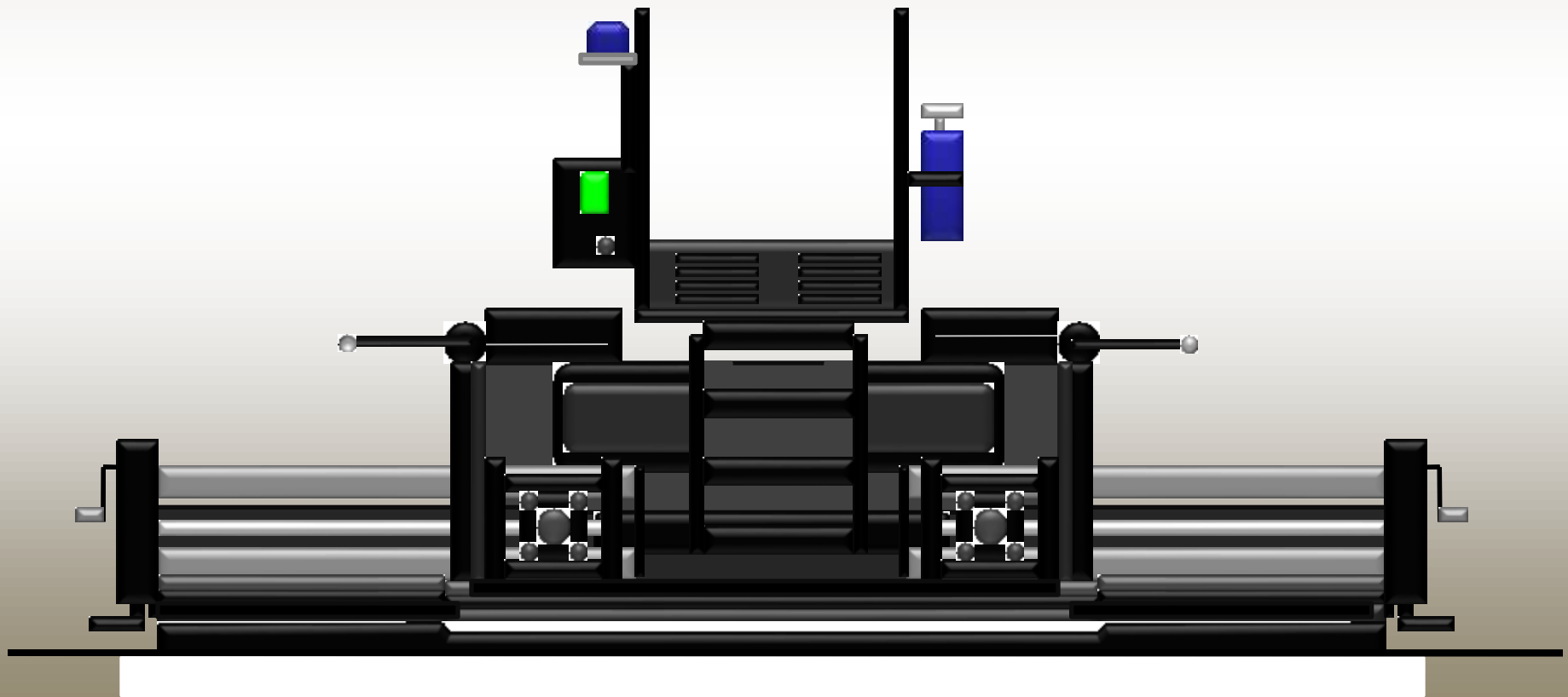
Wedge lock

Rear extendable

Front Extendable



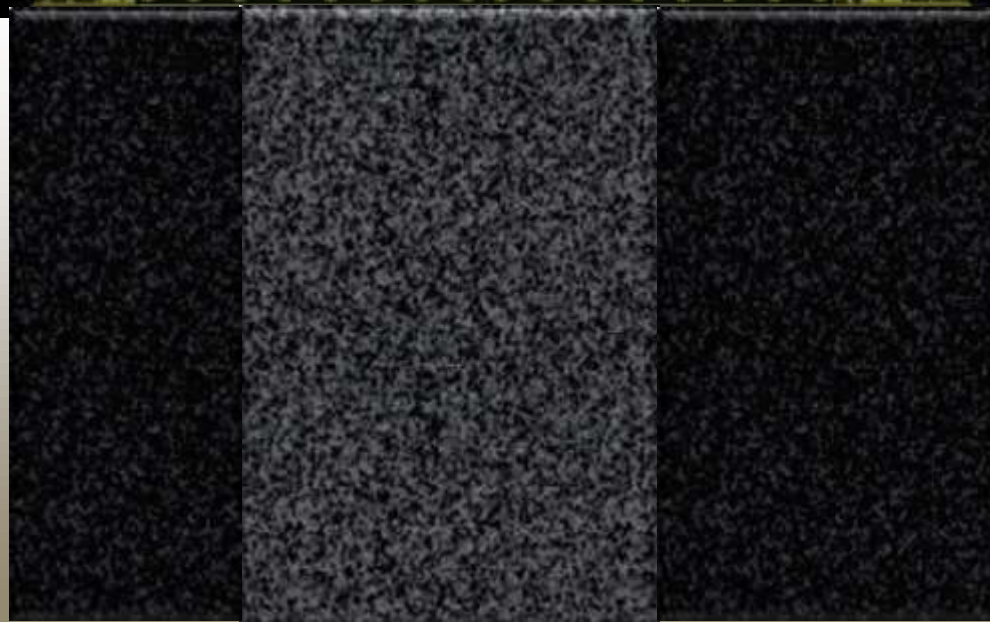
Rear Extendable Screeds



Mat Quality and Texture

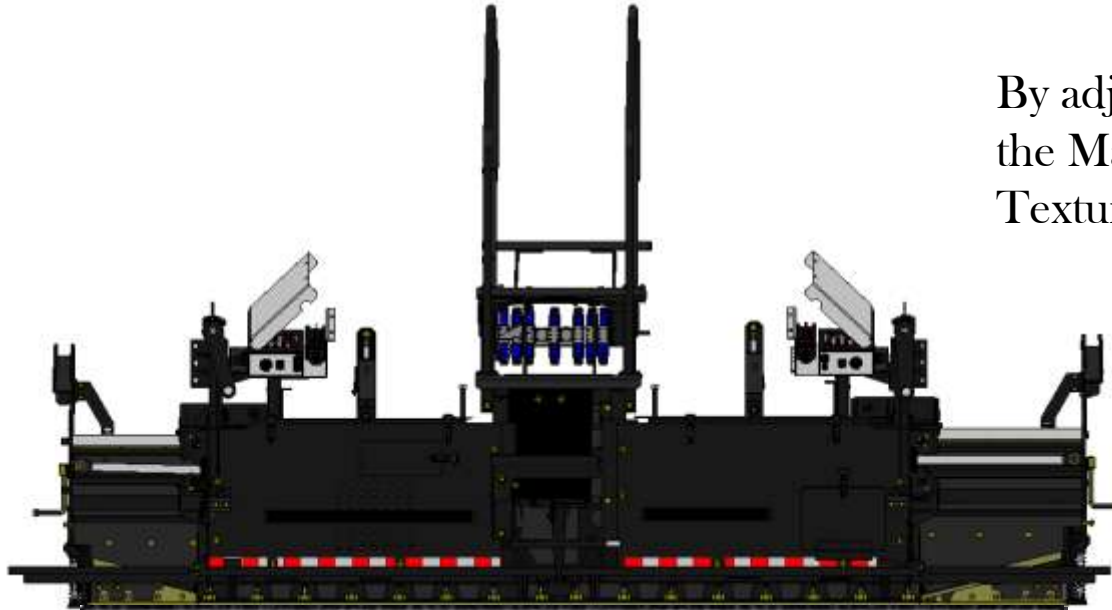
This mat (under extension) is too tight and

The angle of attack jack should be turned approximately one revolution counter clockwise to push the bull nose down to decrease mix feeding under the screed extension, thus transferring more weight to the main screed.

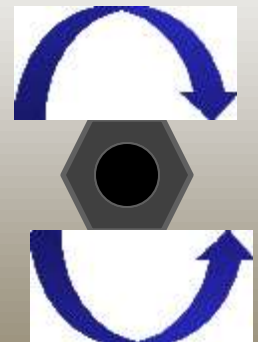


Mat Quality and Texture

By adjusting the extensions to tighten the Mat, you will notice changes in the Texture.



Clockwise tightens the Mat.
Counter Clockwise loosens the Mat.



Clean up and Joint Prep

If the take off or landing weren't important, then they would let the kid in the window seat fly the plane.

If we just set down and pull off without any prep then we will go down.

Setting down and getting the following in order will give us a successful takeoff.

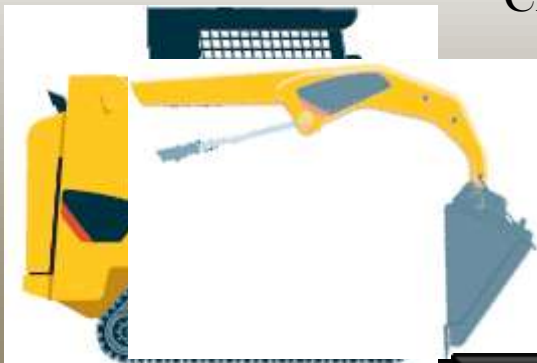
Allow for roll down.

Slow and consistent takeoff.

Take your time before adjusting.

Execute proper material control.

Check the joint with a straight edge.







**Wedge joint I-81
Pennsylvania**



L
O
N
G
-
H
U
D
-
Z
A
-

**Butt joint I-68
Maryland**







Ideal overlap ~ 1"

Practical overlap < 2"

Overlap for 12.5 mm SMA mix



Close-up of joint after rolling



Six months following lay down





Five years after construction











93' L

94' L

95' L

97' L





Thank you!

Questions?

